INSTITUTE OF CHEMISTRY

OF

GREAT BRITAIN AND IRELAND.

(INCORPORATED BY ROYAL CHARTER.)

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REGULATIONS

FOR THE

ADMISSION OF STUDENTS, ASSOCIATES, AND FELLOWS.

EXAMINATION PAPERS: 1902-1903.

AUGUST, 1903.

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INSTITUTE OF CHEMISTRY

OF

GREAT BRITAIN AND IRELAND.

FOUNDED OCTOBER, 1877.

INCORPORATED BY ROYAL CHARTER OF THE 13th DAY OF JUNE, 1885.

Regulations for the Admission of Students, Associates, and Fellows,

AUGUST, 1903.

(EXAMINATION PAPERS FOR 1902-1903.)

Issued by Order of the Council,

RICHARD B. PILCHER,
Registrar and Secretary.

All Communications with reference to the Regulations should be addressed to

THE REGISTRAR OF THE INSTITUTE OF CHEMISTRY,
30, BLOOMSBURY SQUARE, LONDON, W.C.

Office Hours: 10 a.m. to 4 p.m.; Saturdays, 10 a.m. to 2 p.m.

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INSTITUTE OF CHEMISTRY.

INTRODUCTION.

1.—The Institute of Chemistry was founded in October 1877, and incorporated by Royal Charter in June, 1885, (i) to promote the better education of persons desirous of becoming public and technical analysts and chemical advisers on scientific subjects; (ii) to examine candidates, and to grant certificates of competency; and (iii) to elevate the profession of Consulting and Analytical Chemistry by setting up a high standard of scientific and practical proficiency and by insisting on the observance of strict rules in regard to professional conduct.

2.—In pursuance of the provisions of the CHARTER and BYE-LAWS, the Council have made REGULATIONS for the ADMISSION of STUDENTS, ASSOCIATES and FELLOWS.

No person can be admitted to any Examination held by the Institute unless he has passed an approved Preliminary Examination and complied with the Regulations as to Training. (Section 5, pp. 9-11.)

There are three Examinations for admission to the grade of ASSOCIATE, viz:—I. A Preliminary Examination in subjects of General Education. (See page 4.) II. The Intermediate Examination in general Theoretical and Practical Chemistry. (See pp. 12-14.) III. The Final Examination in a Branch of Chemistry selected by the Candidate. (See pp. 15-19.)

In order to become eligible for the Fellowship, an Associate is required to have been continuously engaged for a further term of three years in the study and practical work of applied Chemistry in a manner satisfactory to the Council.

Any Fellow of the Institute may use the initials F.I.C., and any Associate of the Institute, the initials A.I.C.

3.—PRELIMINARY EXAMINATION IN SUBJECTS OF GENERAL EDUCATION.

Candidates must pass this examination before they can be registered.

The Council will accept as an approved Preliminary Examination any examination mentioned below. The Candidate must produce the Certificate of having passed the full examination, and this Certificate must show that he passed, at one and the same time, in all of the following compulsory subjects:—

SUBJECTS:

(*a*) English Language.

(*b*) Latin.

(*c*) Mathematics, comprising Arithmetic, Algebra to simple equations inclusive, and Geometry, including Euclid, Books I., II., III.

(*d*) One of the following:—French, German, Italian, any other Modern Language approved by the Council, Greek, or Logic.

Where the Certificate does not give particulars of the subjects, the Candidate must obtain from the Examining Body a statement giving this information.

APPROVED PRELIMINARY EXAMINATIONS.

Note.—Application for information concerning the Regulations of the following Examinations should be made to the respective Examining Bodies.

Universities in Great Britain and Ireland.

University of Aberdeen.—Senior Local Examination. Preliminary Examinations for Graduation in Arts, Science, or Medicine.

University of Birmingham.—Matriculation Examination.

University of Cambridge.—Senior, or Higher Local Examination. Previous Examination. General Examination.

University of Dublin.—Public Entrance Examination. Examination for the First, Second, Third or Fourth Year in Arts.

University of Durham.—Examination for a Certificate of Proficiency. Senior Local Examination.

University of Edinburgh.—Senior Local Examination. Preliminary Examinations for Graduation in Arts, Science, or Medicine.

University of Glasgow.—Preliminary Examinations for Graduation in Arts, Science, or Medicine.

University of London.—Matriculation Examination.

University of Oxford.—Senior Local Examination. Responsions. Moderations.

Note.—In some cases a Junior or Lower Grade Examination, conducted by a recognised Examining Body may be accepted, if passed in all of the compulsory subjects at one and the same Examination, *prior to* 31*st December*, 1901.

PRELIMINARY EXAMINATION.

University of St. Andrews.—Preliminary Examinations for Graduation in Arts, Science, or Medicine. Final Examination for the Diploma of L.L.A.

Royal University of Ireland.—Matriculation Examination.

Victoria University.—Preliminary Examination. Entrance Examination in Arts or Science.

University of Wales.—Matriculation Examination.

Other Educational Bodies in Great Britain and Ireland.

College of Preceptors.—Examination for a First Class (or Senior) Certificate.

Glasgow and West of Scotland Technical College.—Preliminary Examination for Diploma Students.

Intermediate Educational Board of Ireland.—Senior Grade Examination.

Oxford and Cambridge Schools Examinations Board.—Higher Certificate.

Scotch Educational Department. — Examinations for Higher Grade or Honours Leaving Certificates, passed prior to December, 1902, and for Leaving Certificates, passed since the issue of Higher and Lower Grade Certificates was discontinued.

Central Welsh Board.—Senior Certificate Examination.

Universities and Colleges Abroad.

No Certificate from the Bodies mentioned below will be accepted unless it shows:—That the Examination has been conducted by or under the authority of the body granting it; that it includes all the subjects required by the Council; and, states that all the subjects of Examination have been passed at one time.

Australasia.

Adelaide University.—Senior Public Examination. First Year Examination in Arts.

Melbourne University.—Matriculation Examination.

Sydney University.—Matriculation Examination. First year Examination in Arts. Senior Public Examination. Entrance Examination for Medicine and Science.

Tasmania University.—Senior Public Examination.

Canada.

Kingston: Queen's University.—Departmental Arts Matriculation Examination.

Manitoba University.—Preliminary and Previous Examinations.

Montreal: University of Bishop's College.—Matriculation Examination.
University of McGill College.—Matriculation Examination.

Newfoundland Medical Board.—Preliminary or Matriculation Examination.

New Brunswick: Universities of Frederickton and Mount Allison College.—Matriculation Examinations.

College of Physicians and Surgeons. — Matriculation Examination.

PRELIMINARY EXAMINATION

Canada—*continued.*

Nova Scotia: Dalhousie College and University, Halifax.—Matriculation Examination.

Provincial Medical Board.—Preliminary Examination.

Ontario University.—Departmental Arts Matriculation Examination.

Quebec: College of Physicians and Surgeons of the Province.—Matriculation Examination.

Toronto University.—Departmental Arts Matriculation Examination.

Trinity Medical College.—Departmental Arts Matriculation Examination.

Trinity University.—Departmental Arts Matriculation Examination.

Victoria University.—Departmental Arts Matriculation Examination.

Cape Colony.

Cape of Good Hope University.—Matriculation Examination.

Egypt.

The Secondary Education Certificate of the Egyptian Government.

India and Ceylon.

Allahabad University.—Intermediate Examination in Arts.

Bombay University.—Matriculation Examination.

Calcutta University.—First Examination in Arts.

Ceylon Medical College.—Preliminary Examination.

Madras University.—First Examination in Arts.

Punjab University.—Intermediate Examination in Arts.

(In the case of natives of India or other Oriental Countries an Examination in a Classic Oriental Language may be accepted instead of an Examination in Latin.)

Malta.

University of Malta.—Matriculation Examination.

New Zealand.

New Zealand University.—Preliminary Examination.

Otago University.—Preliminary Examination.

Foreign Universities in Europe.

The German Abiturienten-Examen of the Gymnasia and Real-gymnasia; Examinations entitling to the French Diplomas of Bachelier ès Lettres and Bachelier ès Sciences, and other corresponding Entrance Examinations to the Universities.

4.—REGULATIONS FOR THE ADMISSION OF STUDENTS.

1. **A Candidate is eligible for registration as a Student at any period during his training, provided that he can produce evidence satisfactory to the Council—**

(*a*) That he is not less than 17 years of age.

(*b*) That he has passed an approved Preliminary Examination in all of the requisite subjects at one time (see p. 4).

(*c*) That he is, at the time of application, a student at one of the Universities, Colleges or Schools approved by the Council (p. 41), or a pupil of a Fellow of the Institute, and is *bonâ fide* in course of preparation and training with the object of adopting the profession of Analytical and Consulting Chemistry.

(*d*) That he has paid his first Registration Fee of Five Shillings.

2. The Registration Fee is due on admission and on the first day of January in each year. Any Student who omits to pay his Annual Registration Fee, when due, shall, on a Resolution to that effect being passed by the Council, have his name removed from the Register.

3. All Students of the Institute are required to present themselves for Examination within the term of five years from the date of their admission, otherwise their names will be removed from the Register, unless they can give reasons satisfactory to the Council for an extension of the time being granted.

Forms of application can be obtained from the Registrar.

It is not obligatory on a Candidate to register as a Student, but registration is advisable in view of the circumstance that a Registered Student is required to fulfil only those regulations which are in force at the time of his registration. Any Candidate

who does not become so registered is required to comply with the regulations in operation at the time of his application for admission to the Examinations. Registered Students receive the "Proceedings" containing the Reports of the Examinations with the Pass Lists, Examination Papers and particulars of the practical exercises set, and they are also allowed the use of the Library of the Institute, during the same hours as Fellows and Associates.

GENERAL REGULATIONS AS TO TRAINING.

No course of lectures or other form of instruction in the requisite subjects will be recognised as part of the curriculum for Candidates for the Associateship unless it is given *in the day-time* by the Professor of the subject, in one of the recognised Institutions (p. 41), or in the case of Laboratory work, by duly appointed Assistants, acting under the supervision of the Professor; and unless at the same time sufficient evidence is afforded by the Candidate that during the period of attendance upon such instruction, the whole of his time has been occupied in study or in Laboratory practice, either in a *recognised* College, or in the case of Students who are pupils of Fellows of the Institute (B:—page 11), partly in a recognised College and partly in the Laboratory of such Fellow.

Theoretical and Practical Chemistry are to be regarded as the principal subjects; the other subjects are subsidiary, and should occupy a relatively small proportion, as a rule not more than one-fourth, of the student's time.

A careful inspection of the Syllabus of each of the Examinations held by the Institute will give the Candidate a good general idea of the extent of the knowledge of Chemistry he is expected to acquire. In addition to systematic analytical practice, every Candidate should be able to use the microscope, spectroscope,

polariscope, refractometer, and other instruments commonly used in Chemical Laboratories, and should also be able to draw diagrams of apparatus and instruments.

Attention is directed to the importance of Candidates keeping complete records of their practical work. When presenting themselves for examination they are required to forward such records for inspection by the Examiners, who will take them into account in deciding the Examination. Candidates are expected to be able to use logarithms in their chemical calculations.

5.—COURSES OF TRAINING AND QUALIFICATIONS REQUIRED FOR THE ASSOCIATESHIP.

Every Candidate for the Associateship is required to produce—

1. A certificate of birth or baptism as evidence of age.

Any Candidate under 21 years of age, who has complied with the Regulations, may enter for the Examinations, and, if successful, will be elected to the Associateship on attaining that age.

2. A satisfactory certificate of moral character.

Unless a Candidate for the Associateship has passed any of the Examinations mentioned on p. 12 (Section 6, Clause 2), or on p. 15 (Section 7, Clause 2), he is required to produce evidence of having complied with Clauses 3 and 4 (A or B), before presenting himself for the Examinations conducted by the Institute:—

3. That he has passed an approved Preliminary Examination (see page 4).

TRAINING.

4. That he has completed one of the following courses of training, **A** or **B** :—

COURSE—A.

(*a*) That he has passed satisfactorily through a systematic course of study extending over at least *three academic years*, and has passed the Class Examinations, in **Theoretical and Practical Inorganic and Organic Chemistry,** in any one or more of the Universities or Schools approved by the Council (see p. 41). The amount of practical work shall occupy, on the average during the three years, at least 15 hours per week.

(*b*) That he has worked for at least 100 hours in the Physical Laboratory, has attended at least 50 Lectures on **Physics**, and has passed the Class Examinations in this subject at such University, College or School.

(*c*) That he has attended Lectures on **Elementary Mathematics** and has passed the Class Examinations in this subject at a recognised University, College or School. The Lectures and Examinations must include: Euclid, Books I., II., and III.; Algebra to Quadratic Equations, Ratio and Proportion; Plane Trigonometry to Solution of Triangles, Heights and Distances, Area of a Triangle, and Use of Logarithms.

A certificate of having satisfactorily passed an approved Examination in Mathematics covering the work indicated above will be accepted by the Council in lieu of evidence of a course in this subject having been taken.

(*d*) That he has also attended a course of instruction and passed the Class Examinations in **one optional subject** selected by himself from the following list, viz.:—

(i) MATHEMATICS:—Trigonometry, Differential and Integral Calculus.

(ii) ELEMENTARY MECHANICS, STEAM, AND GENERAL CHEMICAL ENGINEERING:—Properties of Constructive Materials:—Timber, Iron, Steel, Masonry. Principles of Construction of Boilers, Steam Engines, Gas Engines, Water-Wheels, and Turbines, Pumping Engines and Pumps. Dynamo Machines, and Secondary Batteries. Furnaces (10 to 50 Lectures, or an equivalent amount of instruction.)

(iii) METALLURGY :—Furnace Materials and Construction: Fuel (solid, liquid and gaseous), Mechanical Stokers, Pyrometers, Calorimeters, Manufacture and Properties of Iron and Steel. Manufacture of any two other Metals, and their properties. Assay of the metals chosen to be learnt practically. (40 to 50 Lectures, or an equivalent amount of instruction).

(iv) GEOLOGY AND MINERALOGY :—About 40 to 50 Lectures or an equivalent amount of other instruction, with sufficient field or laboratory work once a week for a year, on general Physical and Stratigraphical Geology, Mineralogy, Petrography, and Economic Geology, with special reference to coal-fields, ore deposits, water supply, and drainage.

(v) ELEMENTARY PHYSIOLOGY :—General Biology of Plants and Animals, illustrated by reference to the Structure and Life History of selected types. Histology of Simple Tissues. Composition of Human Food and its Digestion. Circulation of the Blood. Respiration, Secretion and Excretion, Animal Heat. The Functions of the Nervous System. (40 to 50 Lectures or an equivalent amount of instruction, with practical work on the qualitative and quantitative Examination of blood, urine, bile, and milk.)

(vi) BACTERIOLOGY :—The use of the Microscope. The Morphology and Physiology of Micro-organisms. Forty to fifty lectures, or an equivalent amount of instruction with practical work, to include the recognition of microscopic specimens, with systematic instruction and practice in the preparation, staining, mounting and drawing of specimens, as well as the preparation and study of pure cultures.

COURSE—B.

(*a*) That during at least *two academic years* he has regularly attended systematic day courses in each of the following subjects, at any one or more of the Universities, Colleges or Schools, approved by the Council (p. 41), and has passed the Class Examinations in them :—

Theoretical Chemistry, including the ordinary day courses of Lectures on Inorganic and Organic Chemistry given by the Professor ;

Practical Chemistry, including systematic Laboratory Work, three days in each week, and at least five hours each day ;

Physics (as on p. 10) ;

Elementary Mathematics (as on p. 10) ; and

One Optional Subject, selected from the list (*d*) above ; and

(*b*) That he has also been systematically engaged in Analytical Chemistry for *two other years* in the Laboratory of a Fellow of the Institute.

6.—REGULATIONS FOR THE INTERMEDIATE EXAMINATION IN THEORETICAL AND PRACTICAL CHEMISTRY.

1. Candidates who have complied with the conditions of Clauses 1, 2, 3 and 4 of Section 5 are eligible for admission to the Intermediate Examination. Forms of application can be obtained from the Registrar.

2. Candidates who have obtained the Pass Degree of Bachelor of Science in a recognised University, and have complied with Clauses 1 and 2 of Section 5, are also eligible for admission to the Intermediate Examination, provided that they produce evidence, satisfactory to the Council, that they have passed the Final or Degree Examination in Theoretical and Practical Inorganic and Organic Chemistry and Theoretical and Practical Physics, and that they passed the Intermediate or Final University Examination in Mathematics covering the course set forth on p. 10.

3. On or before the date fixed for the closing of the List for each Intermediate Examination, every Candidate desirous of presenting himself is required to forward :—

(1) The form of application duly filled in and accompanied by Certificates containing evidence that the Candidate is entitled to present himself for Examination in accordance with the Regulations.

(2) The Examination Fee (see below).

(3) Note-books containing records of the practical chemical work of all kinds performed during training, the genuineness of the records to be attested by himself and his professors or teachers, according to the note-book form which may be obtained on application to the Registrar.

4. The note-books will be submitted to the Examiners, who will take their contents into consideration and will have power to submit any Candidate to a *viva voce* examination upon them.

5. During the Practical Examinations Candidates will be at liberty to consult any books of reference which they may bring with them, and they may obtain access to the books in the Reference Library of the Institute.

6. The Examination Fee of Five Guineas (£5 5s.) shall be paid at the time of making application for admission to this Examination.

SYLLABUS OF THE INTERMEDIATE EXAMINATION.

The Intermediate Examination occupies at least four days, from 10 *a.m. to* 4.30 *p.m. on each day.*

The Examiners are at liberty to put questions to Candidates at any time during the examination.

The Examination consists of (A) and (B) following :—

(A) **Examination in General Theoretical Chemistry.**

Candidates are required to show a thorough acquaintance with the fundamental laws of Chemistry ; with the methods of preparation of the more important elements, and their compounds both inorganic and organic ; with the principles of Chemical Classification ; and with the current theories of Chemical Science. At least two papers, including questions in both Inorganic and Organic Chemistry, will be set.

(B) **Examination in Practical Chemistry.** This Examination will be partly qualitative and partly quantitative :

QUALITATIVE.

1. Exercises in qualitative analysis : such as the analysis of artificial mixtures of moderate complexity, of alloys, and of ores, and the detection of specified substances present in minute quantities, or as impurities, in commercial products.

2. Preparation of substances so chosen as to elicit evidence of the Candidate's acquaintance with ordinary chemical operations, such as crystallisation, solution, distillation, &c.

3. The recognition, by practical tests, of familiar typical inorganic and organic compounds.

4. The examination of gases, and the detection of one or more of the following in a gaseous mixture: hydrogen, chlorine, hydrogen chloride, hydrogen sulphide, oxygen, ozone, carbon monoxide, carbon dioxide, sulphur dioxide, nitrogen, ammonia, nitric oxide, methane, ethylene, and acetylene.

5. The use of the spectroscope: recognition and diagrammatic plotting of spectra.

6. The use of the microscope: preparation, mounting and measurement of specimens.

Quantitative.

1. The gravimetric and volumetric estimation of commonly occurring substances.

2. The determination of carbon and hydrogen, nitrogen, sulphur, or halogens, in organic compounds.

3. The volumetric determination of one or more of the constituents in a mixture which may contain hydrogen, oxygen, carbon monoxide, carbon dioxide, nitrogen, methane, and ethylene.

4. Determination of boiling point, melting point, relative density, or solubility.

5. The use of the calorimeter and the polariscope.

The examination in quantitative analysis may include the performance of some operation selected from the Candidate's own record.

In doing combustions, the Candidate will be required to prepare his own combustion tubes and drying tubes.

7.—REGULATIONS FOR THE FINAL EXAMINATION FOR THE ASSOCIATESHIP (A.I.C.).

1. Candidates who have passed the Intermediate Examination of the Institute are eligible for admission to the Final Examination.

2. Candidates who have passed any of the following Examinations are exempted from the Intermediate Examination provided they produce evidence, satisfactory to the Council, of having been trained in Theoretical and Practical Chemistry, in Theoretical and Practical Physics, and in one optional scientific subject, in accordance with the Regulations of the Institute (pp. 10-11.):

ABERDEEN: The University.

The Final Examination for the Degree of B.Sc., with Special Distinction in Chemistry.

BIRMINGHAM: The University.

The Final Examination for the Degree of B.Sc. in the subjects of Chemistry and Physics, the Candidate's name being placed in either of the first two Divisions, with Chemistry as his principal subject, including Theoretical and Practical Inorganic and Organic Chemistry.

CAMBRIDGE: The University.

A First or Second Class in Part II. of the Natural Sciences Tripos, with Chemistry as the principal subject.*

DUBLIN: The University (Trinity College).

The Senior Moderatorship in Experimental Science.

The Royal University of Ireland.

The Final Examination for the Degree of B.A., with the Final Examination for B.Sc. or M.A. (involving Inorganic and Organic Chemistry).

* A lower Class will be accepted if the Candidate passed the Examination prior to 1st October, 1902.

FINAL EXAMINATION.

DUBLIN: Royal College of Science.†

The Examination for the Associateship (Assoc. R.C.Sc., Dublin) in the Faculty of Manufactures, passed prior to 1st October, 1902, together with a Certificate from the Professor of Chemistry in the R.C.Sc., Dublin, or in some other University or College recognised by the Institute, that the Candidate has spent an additional period of six months exclusively in the Chemical Laboratory of such College.

DURHAM: The University.

The Final Examination for the Degree of B.Sc. in the subjects of Chemistry and Physics, the Candidate's name being placed in either of the first two Divisions, with Chemistry as his principal subject, including Theoretical and Practical Inorganic and Organic Chemistry.

EDINBURGH: The University.

The Final Examination for the Degree of B.Sc., with Special Distinction in Chemistry.

GLASGOW: The University.

The Final Examination for the Degree of B.Sc., with Special Distinction in Chemistry.

LONDON: The University.

The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.*

City and Guilds of London Central Institute.†

The Examination for the Associateship (A.C.G.I.) in the Department of Chemistry, if passed prior to 1st October, 1902.

Royal College of Science.†

The Examination for the Associateship (Assoc. R.C.Sc., London) in the Division of Chemistry, if passed prior to 1st October, 1902.

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* A lower Class will be accepted if the Candidate passed the Examination prior to 1st October, 1902.

† Candidates who have passed the Examination for one of the following diplomas after 1st October, 1902, and also an Approved Preliminary Examination may claim exemption from the Intermediate Examination provided they produce evidence, satisfactory to the Council, of having been trained in Theoretical and Practical Chemistry, in Theoretical and Practical Physics, and in one optional scientific subject, in accordance with the Regulations of the Institute:

The Associateship of the City and Guilds of London Central Institute (A.C.G.I.), in the Department of Chemistry; the Associateship of

FINAL EXAMINATION.

OXFORD: The University.

A First or Second Class in the Final Honour School of Natural Science in the subject of Chemistry.§

ST. ANDREW'S: The University.

The Final Examination for the Degree of B.Sc., with Special Distinction in Chemistry.

THE VICTORIA UNIVERSITY.

The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.§

THE UNIVERSITY OF WALES.

The Final Examination for the Degree of B.Sc., with First or Second Class Honours in Chemistry.§

3. Candidates may forward, for the inspection of the Examiners, note-books containing duly authenticated records of practical chemical work of an advanced character done by them since passing the Intermediate Examination or not previously inspected, and the contents will be taken into consideration.

4. The Examination Fee shall be paid at the time of making application for admission to this Examination. The Fee for the Final Examination is Five Guineas (£5 5s.) for Candidates who have passed the Intermediate Examination, and Ten Guineas (£10 10s.) for Candidates exempted from passing the Intermediate.

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the Royal College of Science (Assoc. R.C.Sc.), London, in the Division of Chemistry; and the Associateship of the Royal College of Science, Dublin (Assoc. R.C.Sc.I.), in the Faculty of Applied Chemistry, together with a Certificate from the Professor of Chemistry in the R.C.Sc., Dublin, or in some other University or College recognised by the Institute, that the Candidate has spent an additional period of six months exclusively in the Chemical Laboratory of such College.

Note.—The Regulation requiring Associates of the Royal Colleges of Science (London and Dublin) and Associates of the City and Guilds of London Institute to pass an approved Preliminary Examination, will not be enforced in the cases of those who produce evidence, satisfactory to the Council, that they entered on a systematic course of training in Chemistry at a recognised College prior to 1st July, 1902.

FINAL EXAMINATION.

SYLLABUS OF THE FINAL EXAMINATION.

The Final Examination occupies at least four days, from 10 a.m. to 4.30 p.m. on each day; Branch (e) at least five days.

The Examiners are at liberty to apply any test which they think desirable either vivâ voce, or by writing, or by experimental work, in order to obtain evidence as to the knowledge of Theoretical and Practical Chemistry possessed by the Candidate.

1. Each Candidate for the Final Examination is required to show a thorough acquaintance with at least one of the following branches of Chemistry, to be selected by himself :—

(*a*) Mineral Chemistry: including General Inorganic Qualitative and Quantitative Analysis, and the preparation of pure Inorganic Substances.

(*b*) Metallurgical Chemistry: including the Analysis and Assay of Metals, Ores, Fuel, Metallurgical Products, and Materials used in Metallurgical Processes.

(*c*) Physical Chemistry: Candidates are expected to show special theoretical and practical knowledge of the Methods, Instruments and Apparatus employed in Physico-chemical Processes and Investigations.

(*d*) Organic Chemistry: including Ultimate Organic Analysis and the estimation of the Proximate Constituents of Organic Mixtures. The Preparation and detailed investigation of Organic Compounds.

* (*e*) Analysis of Food and Drugs and of Water: including the Examination and Analysis of any food or drug within the meaning of the Sale of Food and Drugs Acts; the Assay of Alkaloids; the recognition of Poisonous Chemicals and Crude Drugs ordinarily found in commerce and having well-marked physical characters; the use of the Microscope in the detection of adulterations, substitutions, commonly occurring parasites, and impurities in Food, Drugs and Water.

Candidates in Section (*e*) are required to show a general knowledge of the Therapeutic Effects of Chemicals and Drugs, and of the quantities which, taken internally, would be injurious or fatal to man. [*This part of the Examination is partly oral and partly written. Books of Reference are not allowed during any part of the Examination conducted by the Examiner in Therapeutics, Pharmacology and Microscopy.*]

† (*f*) Biological Chemistry: with special reference to the Chemistry and Bacteriology of Foods, Water, Sewage and Effluents, and the practical applications of Biological Chemistry to Industries.

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* Candidates desirous of becoming qualified as Public Analysts should take Section (*e*) in the Final Examination, which includes the Examination in Therapeutics, Pharmacology and Microscopy, mentioned on pp. 20-21.

† Candidates intending to enter for the Final Examination in Branch (*f*), viz., Biological Chemistry, are recommended to take (after passing the Intermediate Examination, or any Examination qualifying for admission to the Final) a course of instruction including the following work: A course of 40 to 50 Lectures on the Morphology and Physiology of Micro-organisms, with systematic practical works the latter to include—(a) Microscopy, the preparation, staining, mounting, drawing, and recognition of specimens; (b) the preparation and study of pure cultures; (c) the conduct of fermentation experiments and the study of chemical changes brought about by bacteria, moulds, yeasts, &c.; (d) the study of enzymes and their actions. *The Examination in Biological Chemistry is held in October of each year.*

2. Candidates for the Final Examination are expected to possess, in addition to a general knowledge of all branches of Chemistry, a *thorough* knowledge of the particular branch of Chemistry selected.

3. Any Candidate is at liberty to present a thesis or dissertation upon any Chemical subject to which he has paid special attention, and the thesis, if approved by the Examiners, may be taken as part of the Examination. The thesis must be forwarded not less than fourteen days prior to the first day of the Examination. A statement must accompany the thesis, stating whether the work is the Candidate's own, or whether it has been carried on conjointly with his professor or with another Student.

4. All Candidates must be familiar with the use of such scientific instruments as are commonly used in Chemical Laboratories.

8.—THE FELLOWSHIP (F.I.C.)

1. Every Associate applying for admission to the Fellowship is required to produce evidence :—

(*a*) That he is not less than 24 years of age.

(*b*) That he has since his admission as an Associate, and for a period of three years therefrom been continuously engaged in the study and practical work of applied Chemistry in a manner that shall be satisfactory to the Council.

2. Applications must be made to the Council, and must be accompanied by a letter signed by some responsible person, preferably a Fellow of the Institute, testifying that the Candidate has fulfilled the foregoing conditions.

3. The Entrance Fee payable on election to the Fellowship is Five Guineas. No name can be transferred from the Associates' to the Fellows' List until this fee has been paid.

4. In exceptional cases the Council may elect non-associates to the Fellowship. It rests with the Council to determine in each case whether a Candidate applying for the Fellowship shall be exempted from passing any Examination, or shall be required to pass either the Intermediate or Final Examination or both. The Entrance Fee to the Fellowship is Five Guineas (£5 5s.), and if examination be imposed, or if the Candidate be exempted from passing any examination, an Examination Fee (£15 15s.) must be paid in addition.

5. Every Candidate (not Associate) for election to the Fellowship is required to produce evidence of age, and a satisfactory certificate of moral character.

9.—EXAMINATION IN BIOLOGICAL CHEMISTRY.

In view of the increasing application of bacteriological methods to investigations connected with water supplies and sewage treatment, the Council consider it desirable to encourage analytical chemists in the study of Bacteriology and Biological chemistry.

Accordingly, the Council have resolved that the Examination in Biological Chemistry, (a Branch of the Final Examination for the Associateship), shall be open to Fellows and Associates of the Institute who desire to obtain testimony of their knowledge in this branch of work.

While suited to those intending to practise their profession in its relation to the chemistry and bacteriology of water, sewage and effluents, the Examination can also be taken by those who are interested in the chemistry of Brewing and other industries involving both chemical and bacteriological knowledge, and by pathological chemists.

For further information see p. 18.

10.—SPECIAL EXAMINATION IN THERAPEUTICS, PHARMACOLOGY AND MICROSCOPY.

The Council have made special provision for Fellows and Associates who are desirous of becoming qualified for appointments as Public Analysts, by establishing an Examination in Therapeutics, Pharmacology and Microscopy, to enable such Members to comply with the Regulations of the Local Government Boards with regard to the evidence of competency required for such appointments.

The possession of the diploma of Fellowship or Associateship of the Institute of Chemistry, together with the Certificate granted on passing this Examination, is accepted by the Local Government Board for England and Wales, and the Local Government Boards for Scotland and Ireland, as evidence that the holder is fully qualified for the office of Public Analyst under the Sale of Food and Drugs Acts.

The Examination may include the recognition of specimens of drugs and poisonous chemicals ordinarily to be found in commerce or employed for technical purposes in the Arts or Manufactures; the detection, by microscopical or chemical examination, of adulterations, substitutions, commonly occurring parasites, and impurities in food and drugs. Candidates are also required to show a general knowledge of the therapeutic effects of ordinary drugs, and of the quantities of such drugs or poisonous chemicals which when taken internally would be injurious or fatal to man.

The Examination in Therapeutics, Pharmacology and Microscopy is open to any Fellow or Associate of the Institute of Chemistry, and to any Candidate who has passed the Final Examination for the Associateship but is under the age requisite

for election, who can produce evidence satisfactory to the Council that he has been systematically engaged in the practice of the Analysis of Food and Drugs for at least one year prior to the date of his application for admission to the Examination.

The Examination is practical, written and oral, and will not occupy more than one day.

Books of Reference are not allowed during this Examination.

The Fee for this Examination is Two Guineas (£2 2s.).

Each Candidate who is successful in this Examination will receive a Certificate in Therapeutics, Pharmacology and Microscopy in addition to the Certificate of Membership.

11.—GENERAL INSTRUCTIONS TO CANDIDATES FOR EXAMINATION.

1. The Intermediate and Final Examinations are held each year in January and July, except the Final Examination in Biological Chemistry which is held in October.

2. Forms of Application for admission to Examination, which may be obtained from the Registrar, must be filled up and forwarded to the Office of the Institute and must be accompanied by the enclosures mentioned in these Regulations and referred to in the forms.

3. No name will be placed on the list of Candidates for Examination unless the application, the note-books, declarations, and fee of the Candidate have been received at the Office of the Institute on or before the date fixed for the closing of the list.

4. Due notice of Examination will be given to each Candidate whose application has been accepted by the Council; but

no notice will be forwarded to any Candidate who has not presented himself for Examination within a period of two years from the date of the acceptance of his application, or of his failure at an Examination.

5. The dates of the Examinations will be published in the principal daily papers and scientific journals.

6. Candidates who have previously entered for Examination are not required to fill in new forms of application.

7. Note-books will be provided for the record of the work done at the Examinations. Candidates are required to write their names and bench numbers on the outside of the cover. Each Candidate must make a short summary of his work at the end of his note-book. All calculations must be made by the Candidate in the Examination Laboratory and must be entered in his note-book during Examination hours with an account of the work. Candidates are not permitted to take away their note-books from the Examination Laboratories, and they must deliver them to the Examiners whenever requested.

8. Other instructions for the Examinations may be given by the Examiners or stated in the Examination papers.

9. The list of names of successful Candidates will be sent, as soon as copies are available, to every successful Candidate and to every University, College, or School recognised by the Council, from which any Candidate has proceeded to the Examination. It will also be circulated among the leading newspapers of the United Kingdom.

Unsuccessful Candidates will be informed of the subjects in which they have failed, as soon as possible after the publication of the Pass List.

12.—LIST OF FEES.

	£	s.	d.
STUDENTS.			
Registration Fee (Annual)	0	5	0
EXAMINATION FEES.*			
Intermediate: *For each entry*	5	5	0
Final: Candidates who have passed the Intermediate: *For each entry*	5	5	0
Candidates exempted from passing the Intermediate: *For the first entry*..	10	10	0
For each subsequent entry	5	5	0
Examination in Therapeutics, Pharmacology and Microscopy, open to Fellows and Associates (see p. 21): *For each entry*	2	2	0
Examination in Biological Chemistry, open to Fellows and Associates: *For each entry*	5	5	0
Examination for the Fellowship: *For the first entry* ..	15	15	0
For each subsequent entry	5	5	0

* Fees for Students registered prior to January 1st, 1904, and for Candidates accepted for admission to Examination, prior to that date:—

Intermediate Examination	3	3	0
First Examination after Failure	2	2	0
Final Examination for Associateship: For Candidates who have passed the Intermediate	4	4	0
For Candidates exempted from passing the Intermediate Examination	7	7	0
First Examination after Failure	2	2	0
For an Examination for the Fellowship ...	10	10	0
For each subsequent entry	2	2	0

FEES.

ENTRANCE FEE TO THE FELLOWSHIP.

	£	s.	d.
In the case of Associates elected as such prior to 1st January, 1898 :—	5	5	0
In the case of Associates elected as such after 1st January, 1898 :—			
(*a*) If admitted Fellows prior to 31st December, 1905 :	4	4	0
(*b*) If admitted Fellows after 31st December, 1905 ...	5	5	0

Non-Associates :—

Candidates (not previously Associates) elected to the Fellowship without Examination will be required to pay the amount of the Fee for Examination for the Fellowship (Fifteen Guineas as above) in addition to the Entrance Fee.

Entrance Fee for non-Associates	5	5	0

ANNUAL SUBSCRIPTION.

For Fellows and Associates	1	1	0

LIFE COMPOSITION.

In lieu of the Annual Subscription (open only to Fellows) :—

For Associates elected Fellows before 31st December, 1905	16	16	0
For Non-Associates elected Fellows after 1st January, 1902	21	0	0
For all persons elected Fellows after 31st December, 1905	21	0	0

No Candidate is admitted either as Student, Associate, or Fellow until the Fees prescribed in these Regulations have been paid.

No name is entered on the List of Candidates for an Examination until the fee for the Examination has been paid.

EXAMINATION PAPERS, 1902-1903.

Examiners in Chemistry.
BERNARD DYER, D.Sc. (Lond.), F.I.C.
W. PALMER WYNNE, D.Sc. (Lond.), F.R.S., F.I.C

Examiner in Therapeutics, Pharmacology and Microscopy.
ARTHUR PEARSON LUFF, M.D. (Lond.), F.R.C.P., B.Sc. (Lond.), F.I.C.

JULY EXAMINATIONS. 1902.

Intermediate Examination.

GENERAL AND THEORETICAL CHEMISTRY.

TUESDAY, JULY 22ND, 1902: 10 A.M. TO 1 P.M.

Not more than *five* of the following questions are to be attempted:—

1. What do you understand by the term "Valency"? On what grounds are iodine and sulphur regarded as tervalent and quadrivalent respectively?

2. Give an account of the compounds which nitrogen forms with hydrogen.

3. By what methods may (*a*) ferrous salts, (*b*) cuprous salts be prepared? In what respects do these salts respectively resemble and differ from one another?

4. What relation has been traced between the depression of the freezing point of a solvent and the molecular weight of the substance dissolved in it?

Successive quantities of 0·317, 0·394 and 0·5152 gram of a substance were dissolved in 18·054 grams of benzene, the

depression of the freezing point being 0·278°, 0·348° and 0·452° respectively; What is the molecular weight of the substance? The molecular lowering of the freezing point of benzene is 50.

5. Give an account of the isomerism existing among the organic cyanides. To which group of cyano-derivatives do you consider hydrogen cyanide to belong, and why?

6. By what means may the various forms of tartaric acid be converted into one another? Give the stereo-chemical formulæ assigned to the isomeric acids.

7. How is phthalic acid prepared on the large scale, and what are its properties? For what reasons is this acid of much industrial importance?

TUESDAY, JULY 22ND, 1902: 2 P.M. TO 5 P.M.

Not more than *five* of the following questions are to be attempted:—

8. What happens when a solution of potassium chloride is added to (*a*) a solution of sodium nitrate, (*b*) a solution of silver nitrate, in equivalent proportions? Give the evidence on which your reply is based, and explain the difference between the results in the two cases.

9. What are the chief points of resemblance and difference between corresponding magnesium and calcium compounds? Justify the inclusion of the two elements in the same group of Mendeleef's table.

10. By what methods is sodium prepared on the large scale? For what purposes is the metal employed industrially and in the laboratory?

11. What do you understand by the heat of formation of a substance? Calculate the heat of formation of methane from the following data:—

$(C,O_2)=96{,}960$. $(H_2,O)=68{,}360$. $(CH_4,O_4)=213{,}500$.

12. What do you understand by the terms:—tautomerism, hydrolysis, enzyme, lactone, carbohydrate?

13. If you were given a halogen compound, what experiments would you make in order to determine whether it belonged to the fatty or the aromatic series?

14. Describe and explain the preparation of phenylhydrazine in a pure state, and the purposes for which it is used.

PRACTICAL CHEMISTRY.

Wednesday, July 23rd, 1902: 10 a.m. to 4.30 p.m.

Determine the amount of available oxygen and of manganese in the given specimen of pyrolusite.

Thursday, July 24th, 1902: 10 a.m. to 4.30 p.m.

1. Analyse qualitatively the given mixture (A). (Calcium phosphate and mercury cyanide; calcium carbonate and zinc ferrocyanide; lead carbonate and potassium ferrocyanide. *One* mixture given to each Candidate.)

2. The given substance (B) contains not more than one radicle of the same kind. Ascertain what radicles are present in it; determine its molecular weight by a chemical method, and leave specimens of any products you are able to prepare from it. (Naphthylamine-sulphonic acid.)

Friday, July 25th, 1902: 10 a.m. to 4.30 p.m.

1. The given substance (A) is a mixture of barium and calcium carbonates. Determine the proportion of each in the mixture.

2. The given liquid (B) contains two organic substances. Identify them and separate one in as pure a state as you can. (Methyl alcohol and glycerol; ethyl alcohol and glycerol; acetone and glycerol. *One* mixture given to each Candidate.)

Final Examinations for the Associateship.

Branch "A."—Mineral Chemistry.

Tuesday, July 15th, 1902: 10 a.m. to 4.30 p.m.

1. The liquid (A) supplied to you is a solution of a chloride together with free hydrochloric and acetic acids. Make such experiments as you can in one day's work with the view of determining the approximate combining weight of the basic element. State in precise terms the conclusions to be drawn from your results, and the necessary limitations of these conclusions. (Barium chloride.)

2. Examine the liquid (B) with the spectroscope and state the results of your observation. (Barium chloride and lithium chloride; strontium chloride and thallium chloride; potassium chloride and lithium chloride. *One* mixture given to each Candidate.)

Wednesday, July 16th, 1902: 10 a.m. to 4.30 p.m.

1. Determine the phosphoric acid and lime in the sample of natural mineral phosphate (A). (This analysis may be finished to-morrow.)

2. Make a qualitative analysis of the mineral powder (B) distinguishing between principal elements and those present in small or industrially insignificant quantity.

Thursday, July 17th, 1902: 10 a.m. to 4.30 p.m.

1. Complete the analysis of the phosphate, begun yesterday.

2. Determine the quantity of iodine present in 100 c.c. of the given solution of potassium chlorate and potassium iodate.

Friday, July 18th, 1902: 10 a.m. to 4.30 p.m.

Make as full an analysis as you can of the gaseous mixture supplied to you.

Branch "B."—Metallurgical Chemistry.

TUESDAY, JULY 22ND, 1902: 10 A.M. TO 4.30 P.M.

Make as complete an analysis as you can of the sample of "white metal." (This exercise may be completed to-morrow.)

WEDNESDAY, JULY 23RD, 1902: 10 A.M. TO 4.30 P.M.

1. Complete the analysis begun yesterday.

2. Make a qualitative analysis of the given mineral powder, distinguishing between main and subsidiary constituents.

THURSDAY, JULY 24TH, 1902: 10 A.M. TO 4.30 P.M.

1. Determine the percentage of arsenic in the sample of copper.

2. Determine the percentage of sulphur in the sample of fuel.

FRIDAY, JULY 25TH, 1902: 10 A.M. TO 4.30 P.M.

Make as full an analysis as you can of the mixture of gases supplied to you. (No constituent is present which might not be found in the gas drawn from a furnace chimney.)

Branch "C."—Physical Chemistry.

TUESDAY, JULY 22ND, 1902: 10 A.M. TO 4.30 P.M.

1. Calibrate the burette supplied and plot the corrections.

2. Show, with the help of the freezing point method, that the inversion of cane sugar involves an increase in the number of molecular units in solution.

Wednesday, July 23rd, 1902: 10 a.m. to 4.30 p.m.

Determine and record graphically the form of freezing point curve for mixtures of urea and phenol, containing from 0 to 30 per cent. of urea.

Thursday, July 24th, 1902: 10 a.m. to 4.30 p.m.

You are supplied with barium nitrate and concentrated nitric acid. Find, at the temperature of the tap water, (1) the solubility of barium nitrate in water, (2) the extent to which this solubility is influenced by the presence of nitric acid, the concentration of the acid being 0·5 N to 1·5 N.

Show graphically the relation between the molecular concentrations of barium nitrate and nitric acid in the various solutions.

Friday, July 25th, 1902: 10 a.m. to 4.30 p.m.

1. The given substance (A) is a mixture of barium and calcium carbonates. Determine the proportion of each in the mixture.

2. The given liquid (B) contains two organic substances. Identify them and separate one in as pure a state as you can. (Methyl alcohol and glycerol; acetone and glycerol. *One* mixture given to each Candidate.)

Branch "D."—Organic Chemistry.

Tuesday, July 15th, 1902: 10 a.m. to 4.30 p.m.

Estimate the number of methoxyl groups in the given substance. Identify the substance and from it prepare as many derivatives as you can. (Anisic acid.)

Wednesday, July 16th, 1902: 10 a.m. to 4.30 p.m.

Estimate the amount of pentosans in the given material (gum arabic), and leave for inspection the furfuraldehyde hydrazone weighed. (The weighing, if necessary, may be completed to-morrow.)

THURSDAY, JULY 17TH, 1902: 10 A.M. TO 4.30 P.M.

Isolate the constituents of the given liquid in a state of purity and determine their relative proportion. Leave specimens of the pure substances and of any derivatives prepared for the purpose of identification.

(Nitrobenzene and benzaldehyde.)

FRIDAY, JULY 18TH, 1902: 10 A.M. TO 4.30 P.M.

1. What radicles are present in the substance A? Prepare derivatives the formation of which supports your conclusions, and leave specimens for inspection.

(Cinnamic acid.)

2. The solution B contains a mixture of dextrose and cane sugar. Determine the proportion of each in a litre of the given solution.

Branch "E."—The Analysis of Food and Drugs, and of Water.

TUESDAY, JULY 15TH, 1902: 10 A.M. TO 4.30 P.M.

1. Determine the original gravity of the sample of beer (A).

2. Examine the sample of wine (B) for salicylic acid and, if you find it to be present, determine the approximate proportion.

3. Identify the given drug (C). (Phenacetin; antifebrin; antipyrin. *One* drug given to each Candidate.)

WEDNESDAY, JULY 16TH, 1902: 10 A.M. TO 4.30 P.M.

The oil placed before you is a mixture of castor oil and olive oil. Determine the "acetyl value" of the mixture, and, from your result, deduce the approximate percentage of castor oil present.

THURSDAY, JULY 17TH, 1902: 10 A.M. TO 4.30 P.M.

Investigate, as far as you can in one day's work, the chemical and physical properties of the given carbohydrate. Identify it, stating clearly your reasons. (Dextrose; maltose; lactose. *One* carbohydrate given to each Candidate.)

FRIDAY, JULY 18TH, 1902: 10 A.M. TO 4.30 P.M.

1. Examine the sample of lemonade for poison.

2. Determine the nitric nitrogen in the sample of water.

Candidates in Branch "E" of the Final Examinations were required to pass the Examination in Therapeutics, Pharmacology, and Microscopy, on July 19th.

Examination in Therapeutics, Pharmacology and Microscopy.

SATURDAY, JULY 19TH, 1902: 10 A.M. TO 12 NOON.

1. Examine the specimen of mustard marked A, and report on its probable purity or otherwise, basing your opinion on the microscopical appearances only. Leave a prepared slide on your bench.

2. Examine, describe and state respectively the nature of the prepared slides marked B and C.

3. Mention all the preparations (official or otherwise) containing opium or morphine with which you are acquainted. Give their respective strengths and the quantities of them that would be likely to produce a fatal result.

4. What injurious effects have been produced by the consumption of beer contaminated with arsenic? What are the various channels by which arsenic gains access to beer? What amount (if any) of arsenic would you consider permissible in beer?

5. Give the average fatal doses for an adult of the following poisons:—Chloral, strychnine, nitric acid, aconitine, tartar emetic, corrosive sublimate.

*** Candidates were also examined practically, and interrogated orally, as to the recognition of Drugs.

JANUARY EXAMINATIONS, 1903.

Intermediate Examination.

GENERAL AND THEORETICAL CHEMISTRY.

TUESDAY, JANUARY 6TH, 1903: 10 A.M. TO 1 P.M.

Not more than *four* of the following questions are to be attempted:—

1. Phosphorus and sulphur exist in polymeric forms. Give an account of the methods by which the molecular weights of these elements have been ascertained.

2. Describe and explain what happens (*a*) when potassium cyanide is added to an aqueous solution of copper sulphate; (*b*) when sulphuretted hydrogen is passed into an aqueous solution of sodium arsenite; (*c*) when platinic chloride is added to an aqueous solution of potassium iodide.

3. From what ores is nickel obtained, and how may the metal be prepared in a pure state from one of them?

4. Starting with potassium cyanide, how may urea be prepared? Give an account of the products obtained from urea by the action of heat.

5. From what source is glycerol obtained? How has its constitution been proved, and what products does it yield on oxidation?

6. Describe *either* (*a*) how caffeine may be obtained from tea, *or* (*b*) how quinine may be obtained from cinchona bark. Of what substances may these compounds be regarded as derivatives, and what are their chief chemical characteristics?

TUESDAY, JANUARY 6TH, 1903: 2 P.M. TO 4.30 P.M.

Not more than *four* of the following questions are to be attempted:—

7. When equivalent quantities of a base like sodium hydroxide and an acid like hydrochloric acid are mixed in dilute solution, the development of heat in the reaction is approximately 13,800 cals. When, however, ammonia is used as the base, or acetic acid as the acid, widely different values are obtained. How do you explain these facts?

8. How may barium peroxide be obtained from barytes, and for what purposes is it used?

9. Give directions for the preparation of *one* inorganic and *one* organic substance selected from the following list, and describe their appearance and properties:—nitrosyl chloride, chromyl chloride, acetophenone, cinnamic acid.

10. Give an account of Faraday's work on electrolysis. What is the effect of passing an electric current through aqueous solutions of sodium chloride, copper sulphate, and potassium acetate (both dilute and concentrated)?

11. Describe and explain the production of chloral from alcohol, and give an account of its properties, contrasting them with those of ordinary aldehyde.

12. Terephthalic acid is known to be benzene-*para*-dicarboxylic acid. Using this acid as a reference compound, how would you prove that sulphanilic acid contains its substituents in the *para*-position relatively to one another? Describe briefly the methods you would employ.

PRACTICAL CHEMISTRY.

WEDNESDAY, JANUARY 7TH, 1903: 10 A.M. TO 4.30 P.M.

1. The given solution contains ammonium phosphate and another substance. Identify the latter, and determine its amount per litre. (Potassium oxalate.)

2. Analyse qualitatively the given mixture. (Copper sulphate and zinc sulphide; copper sulphate and sodium thiosulphate; nickel sulphate and sodium thiosulphate. *One* mixture given to each candidate.)

THURSDAY, JANUARY 8TH, 1903: 10 A.M. TO 4.30 P.M.

The given solution contains the hydrochloride of a base. Prepare from it (1) a specimen of the acetyl derivative, and determine its melting point; (2) a specimen of the platinichloride, and determine the percentage of platinum in it. Leave specimens of the products you obtain. (Solutions of ortho-toluidine and *para*-toluidine in hydrochloric acid. *One* solution given to each Candidate.)

Identify the substance in the given aqueous solution. (Iron quinine citrate.)

FRIDAY, JANUARY 9TH, 1903: 10 A.M. TO 4.30 P.M.

Determine the amount per litre of potassium dichromate in the given solution (1) by a process involving distillation, (2) by a gravimetric process.

Final Examinations for the Associateship.

Branch "A."—Mineral Chemistry.

TUESDAY, JANUARY 13TH, 1903: 10 A.M. TO 4.30 P.M.

1. Determine the silica, alumina, oxide of iron, lime, and magnesia in the sample of cement. (This analysis to be begun to-day and finished to-morrow.)

2. The mixture supplied to you consists of potassium carbonate, potassium nitrate and potassium sulphate. Estimate the percentage of K_2CO_3 by a gravimetric method, and, aided by the result, estimate by means of a gasometric experiment the percentage of KNO_3 present. (This exercise to be completed to-day.)

Wednesday, January 14th, 1903: 10 a.m. to 4.30 p.m.

Complete the analysis of the sample of cement given yesterday.

Thursday, January 15th, 1903: 10 a.m. to 4.30 p.m.

Determine the percentage of zinc in the sample of zinc blende.

Friday, January 16th, 1903: 10 a.m. to 4.30 p.m.

Determine the percentage of total sulphurous acid (SO_2) in the sample of commercial calcium bisulphite.

Branch "B."—Metallurgical Chemistry.

Tuesday and Wednesday, January 13th and 14th, 1903: 10 a.m. to 4.30 p.m. on each day.

Determine the percentages of chromium and of nickel in the sample of steel.

Determine the percentage of alkalies in the sample of fireclay.

Thursday and Friday, January 15th and 16th, 1903: 10 a.m. to 4.30 p.m. on each day.

Determine the percentages of sulphur and of copper in the given copper ore. (N.B.—At least one determination of copper is to be made by an electrolytic method involving deposition of the copper by means of an externally generated current.)

Branch "C."—Physical Chemistry.

Tuesday, January 13th, 1903: 10 a.m. to 4.30 p.m.

Find the specific gravity of the given liquid at two temperatures, one of them being its own boiling point.

Determine also the molecular weight of the substance by Dumas' method. (Chloroform.)

Wednesday, January 14th, 1903: 10 a.m. to 4.30 p.m.

1. Construct a temperature regulator, and employ it to regulate the temperature of a water bath to 30°.

2. Investigate with the help of the freezing point method the molecular condition of phenol and phenetol in benzene solution, determining the influence, if any, of the concentration.

Thursday, January 15th, 1903: 10 a.m. to 4.30 p.m.

Prepare a solution of diazobenzene chloride as follows:—

Dissolve 6·64 grams of aniline in 21·4 c.c. of HCl (sp. gr. = 1·16); cool in ice water and add gradually a solution of 4·9 grams of $NaNO_2$ in 75 c.c. of water; make the solution up to a litre, and place 35 c.c. in a small flask.

Determine the rate of decomposition of the diazobenzeoe chloride at 30° by measuring from time to time the nitrogen that has been evolved. (The gas should be collected in a jacketed Hempel's burette.)

Find how far the experimental data warrant you in regarding the reaction as unimolecular.

Friday, January 16th, 1903: 10 a.m. to 4.30 p.m.

Determine the resistance capacity of the given electrolytic cell and find the degree of dissociation of acetic acid in $\frac{N}{10}$, $\frac{N}{100}$ and $\frac{N}{1000}$ solution at 26°, having given $\Lambda\infty$ for acetic acid at 25° = 388.

Branch "D"—Organic Chemistry

Tuesday, January 13th, 1903: 10 a.m. to 4.30 p.m.

Ascertain what radicles are present in the given substance, and determine the percentage of one of them by a process which does not involve combustion.

Prepare from the substance as many derivatives as you can. (*para*-anisidine.)

Wednesday, January 14th, 1903 : 10 a.m. to 4.30 p.m.

The given dyestuff is to be examined with the object of ascertaining how it can be made. Supply as far as you can the desired information.

Any operation started to-day, but not completed, may be finished to-morrow.

Thursday, January 15th, 1903 : 10 a.m. to 4.30 p.m.

The given preparation is purchasable, under a trade name, for medicinal use. Ascertain its composition. (Mixture of acetanilide and caffeine).

Friday, January 16th, 1903 : 10 a.m. to 4.30 p.m.

Investigate the given substance, and prepare from it as many derivatives as you can. (Mannitol).

Branch "E."—The Analysis of Food and Drugs and of Water.

Tuesday, January 6th, 1903 : 10 a.m. to 4.30 p.m.

Determine the percentage of nitrogen in the sample of meal, preparing your own volumetric solutions of acid and alkali. (Lentil meal).

Leave on your bench portions of both solutions, bearing labels defining, as nearly as you can, their exact strength.

Wednesday, January 7th, 1903 : 10 a.m. to 4.30 p.m.

1. Determine the total percentage of tar acids (carbolic acid and cresylic acid) in the sample of disinfecting powder.

2. Determine by ether extraction the percentage of "fatty" matters in the egg powder submitted to you, and estimate the quantity of lecithin in the extract, by means of a determination of the phosphorus contained in it. (This exercise may be completed to-morrow.)

Thursday, January 8th, 1903: 10 a.m. to 4.30 p.m.

Proceed with the lecithin estimation begun yesterday.

Estimate the *percentage by weight* of nitrous ether in the sample of sweet spirit of nitre, using the process of analysis described in the British Pharmacopœia.

Friday, January 9th, 1903: 10 a.m. to 4.30 p.m.

The "tea" (infusion of tea with milk and sugar) submitted to you contains poison. Identify the poison, and determine approximately how much is present, expressing your results as grains per pint. (Arsenious acid; barium chloride; oxalic acid. *One* poison only supplied to each Candidate.)

Candidates in Branch "E" of the Final Examinations were required to pass the Examination in Therapeutics, Pharmacology, and Microscopy, on January 10th.

Saturday, January 10th, 1903: 10 a.m. to 1 p.m.

1. Examine the specimen of oatmeal marked A, and report on its probable purity or otherwise, basing your opinion on the microscopical appearances only. Leave a prepared slide on your bench.

2. Examine the specimen of precipitated sulphur marked B, and report on its probable purity or otherwise, basing your opinion on the microscopical appearances only. Leave a prepared slide on your bench.

3. Examine, describe and state respectively the nature of the prepared slides marked C and D.

4. Mention the various preservatives employed in food. What effects, if any, may be produced on the human system by such preservatives in the quantities as ordinarily used in food? State generally your opinion as to the desirability or not of preservatives in articles of food.

5. Give the full medicinal and the average fatal doses for an adult of the following substances: phosphorus, lead acetate, nitroglycerine, carbolic acid, croton oil, antifebrin (acetanilide).

Candidates were also examined practically and interrogated orally as to the recognition of Chemicals and Drugs.

List of Universities, Colleges and Institutions, recognised for the Training of Candidates for the Examinations of the Institute of Chemistry.

Aberdeen	The University.
Aberystwyth	University College.
Bangor	University College.
Belfast	Queen's College.
Birmingham	The University.
Bristol	†Merchant Venturers' Technical College
,, ...	University College.
Cambridge	The University.
Cardiff	University College.
Cork	Queen's College.
Dublin	Royal College of Science for Ireland.
,, ...	Trinity College.
Dundee	University College.
Edinburgh	†The Heriot-Watt College.
,, ...	The University.
Galway	Queen's College.
Glasgow	The University.
,, ...	The Glasgow and West of Scotland Technical College.
Leeds	Yorkshire College.
Liverpool	University College.
London	City and Guilds Institute, Central Technical College.
,, ...	City and Guilds Institute, Finsbury Technical College.
,, ...	King's College.
,, ...	Royal College of Science.
,, ...	*School of the Pharmaceutical Society of Great Britain.
,, ...	University College.
Manchester	Owens College.
Newcastle-on-Tyne ...	Durham College of Science.
Nottingham	University College.
Oxford	The University.
Sheffield	University College.
St. Andrew's	The University.

*Recognised for Chemistry only. †Recognised Provisionally.

Institute of Chemistry Laboratories,

30, Bloomsbury Square, London, W.C.

The Laboratories of the Institute of Chemistry may be used by other Examining Bodies and Institutions for Examination Purposes.

Particulars may be obtained from the Registrar.

The Library

Is open for the use of Fellows, Associates and Registered Students, between the hours of 10 a.m. and 6 p.m. on every week-day, except on Saturday afternoons and during the Examinations.

A. P. Blundell, Taylor & Co., Printers, 173, Upper Thames Street, London, E.C.